REMARKS

The disclosure is objected to because of certain informalities. The specification is amended at page 3 line 23 and at page 4 line 1 to correct the informalities. It is believed that the objections to the disclosure are overcome.

Claim 4 is objected to because of informalities. The claim is amended such that it is believed that the objection to the claim is overcome. Reconsideration of the objection is resepectfully requested.

Claims 1-3 and 5-7 are rejected under 35 U.S.C. §102(e) as being anticipated by Tanabe, et al. (U.S. Patent Number 6,323,115). Claims 4 and 8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Tanabe, et al. In view of the amendments to the claims and the following remarks, the rejections are respectfully traversed, and reconsideration of the rejections is requested.

In the applicants' invention, a nitrogen-containing gas is used in performing a selective oxidation process along with hydrogen-rich vapor. The nitrogen combines with the metal in a metal gate electrode pattern to form metal nitride. As a result, the metal cannot react with oxygen in the process chamber, such that oxidation of the metal is minimized (see applicants' specification at page 8 lines 1 through 18).

The claims are amended to specifically point out that the gas ambient used during the selective oxidation process includes a non-inert nitrogen-containing gas which combines with the metal to form metal nitride during the oxidation process. It is believed that these amendments to the claims serve to clarify the distinctions between the invention and the cited Tanabe, et al. patent.

Tanabe, et al. disclose the use of an inert gas such as argon, oxygen and nitrogen to discharge nitrogen from the process chamber. In Tanabe, et al., there is no teaching or suggestion of introducing a non-inert nitrogen-containing gas into the process chamber during an oxidation reaction to form metal nitride on a metal gate electrode structure. Accordingly, Tanabe, et al. fail to teach or suggest the invention set forth in the amended claims. Therefore, it is believed that the claims are allowable over the Tanabe, et al. reference, and reconsideration of the rejections of the claims under 35 U.S.C. §§102(e) and 103(a) based on Tanabe, et al. is

respectfully requested.

Attached hereto is a marked-up version of the changes made to the application by the current Amendment. The attached pages are captioned "Version with Markings to Show Changes Made."

In view of the foregoing remarks, it is believed that all claims pending in the application are in condition for allowance, and such allowance is respectfully solicited. If a telephone conference will expedite prosecution of the application, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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Version with Markings to Show Changes Made

In the Specification

The paragraph at page 3 line 12 through page 4 line 4 has been amended as follows:

- - However, the selective oxidation process described above has a narrow process margin, and it is difficult to adjust the partial pressures of the hydrogen gas and H_2O to only oxidize the silicon. Accordingly, as shown in Fig. 2A, a small amount of the tungsten is oxidized, so that tungsten oxide 12c is formed on side walls of the tungsten layer 16. As shown in Fig. 2B, the insulative tungsten oxides 12c causes whiskers 24 due to a thermal energy that is applied to the tungsten oxide 12c during a heating process of subsequent semiconductor device manufacturing processes. Thus, an electrical short between the gate electrodes adjacent each other can be caused by the whiskers. The whiskers 24 are formed due to an amorphous phase and nucleation cites on the surface of the tungsten oxide 12c. That is, surface mobility of the tungsten oxide [13c] 12c having amorphous phase is increased by the thermal energy during a heating process, then the amorphous tungsten oxide [13c] 12c is moved toward the nucleation cites and crystallized at the nucleation cites, so that the whiskers 24 are formed. Accordingly, it is required to completely suppress the oxidation reaction of the tungsten during the selective oxidation process - -.

In the Claims

The claims have been amended as follows:

1. (Amended) A method of forming a metal gate electrode having a silicon layer, a conductive barrier layer and a metal layer, the method comprising the steps of:

forming a metal gate electrode pattern comprised of the silicon layer, the conductive barrier layer and the metal layer; and

performing a selective oxidation process to the metal gate electrode pattern in a nitrogen containing gas ambient comprising a non-inert nitrogen containing gas which combines with the metal layer to form a metal nitride during the selective oxidation process.

2. (Amended) The method according to claim 1, wherein the nitrogen containing gas includes one or more gases [out] selected from the group consisting of [nitrogen,] nitrogen monoxide, nitrogen oxide and ammonia.

4. (Amended) The method according to claim 1, wherein the nitrogen permeates a metal oxide layer which is formed during the selective oxidation process on a surface of the conductive barrier layer and the metal layer, [the nitrogen decreasing] decreases surface mobility of the metal oxide layer, and [preventing] prevents formation of nucleation cites of whiskers on the metal oxide layer.

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